LIVERMORE LAB REPORT

A weekly compendium of media reports on science and technology achievements at Lawrence Livermore National Laboratory, July 7-11. Though the Laboratory reviews items for overall accuracy, the reporting organizations are responsible for the content in the links below.

San Francisco Chronicle

A TRIP DOWN MEMORY LANE

Lawrence Livermore engineer Vanessa Tolosa holds up a silicon wafer containing micromachined implantable neural devices.

Ever have problems remembering? Help may be on the way.

Lawrence Livermore recently received funding to develop an implantable neural device with the ability to record and stimulate neurons within the brain to help restore memory.

The research builds on the understanding that memory is a process in which neurons in certain regions of the brain encode information, store it and retrieve it. Certain types of illnesses and injuries, including traumatic brain injury, Alzheimer's disease and epilepsy, disrupt this process and cause memory loss.

The goal is to develop a device that uses real-time recording and closed-loop stimulation of neural tissues to bridge gaps in the injured brain and restore individuals' ability to form new memories and access previously formed ones.

To read more, go the *San Francisco Chronicle*

SERVICING SOLDIERS

Lab scientists Nicholas Be (left) and Jonathan Allen examine the Lawrence Livermore Microbial Detection Array.

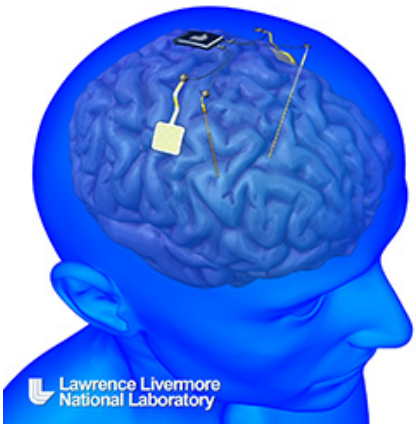
For American soldiers wounded in combat, identifying infections can mean the difference between life and death. Now, researchers at Lawrence Livermore believe they can deliver that power to the battlefield and beyond.

It comes in the form of a tiny microarray, slightly larger than a matchbox. In a sense, it is a laboratory on a chip. The device is designed to identify thousands of different viruses and bacteria that might be present in a wound.

"The ability to really comprehensively look at what's in a wound is powerful. We don't have to say, 'OK, we want to look for MRSA or want to look for *E.coli* or we want to look for this or that.' We can say, we're going to look for everything," researcher Nicholas Be said.

To read more, go to *ABC News*.

IT'S ALL IN YOUR HEAD



This rendering shows the next generation neural device capable of recording and stimulating the human central nervous system, which is being developed at Lawrence Livermore National Laboratory.

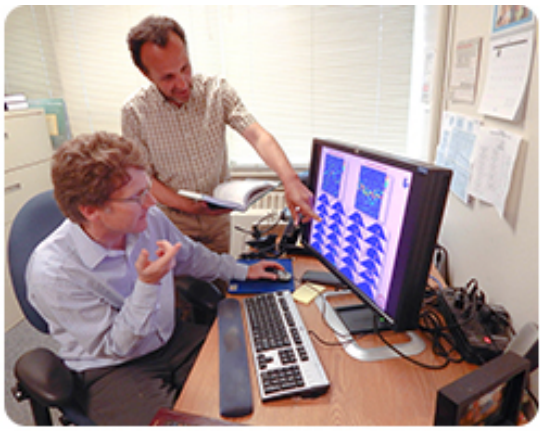
Doctors will soon be able to better understand and treat post-traumatic stress disorder (PTSD), traumatic brain injury, chronic pain and other conditions thanks to a new technology under development at Lawrence Livermore National Laboratory.

LLNL scientists are working on an implantable neural interface that can record and stimulate neurons within the brain to treat neuropsychiatric disorders.

Several years ago, researchers at LLNL, in conjunction with Second Sight Medical Products, developed an artificial retina, the world's first neural interface, that was successfully implanted into blind patients to help partially restore their vision. The new neural device is based on similar technology.

To read more, go to *Medical Design Briefs*.

PHYS.ORG **DAMS SAFE AFTER A WHOLE LOTTA SHAKING**



Lee Glascoe, a mechanical engineer at Lawrence Livermore National Laboratory, and his colleague, geotechnical engineer Souheil Ezzedin, examine a simulation bridging grain-scale erosion patterns to possible large-scale dam failure.

There has long been a concern among civil engineers that dams could fail days or weeks after an earthquake, even if no immediate evidence of a problem surfaced.

Their concern focused on possible cracks at the interface between the concrete section of a dam and the soil embankments at the dam's sides, and on how the soil filters nestled amidst the embankments would fare.

Since soil filters were instituted, their design standards have been based on experimental studies without detailed and validated computer modeling of the soil grains -- until now.

For the first time, under a collaboration between Lawrence Livermore and the U.S. Army Corps of Engineers' Engineer Research and Development Center, researchers have completed a study demonstrating the effectiveness of soil filters at the soil grain scale.

To read more, go to *Phys.org*.

Sequoia is a 20-petaflop supercomputer housed at Lawrence Livermore.

Around the developed world, governments are pushing for ever-faster computers (also known as exascale computing), as they believe that the wider dissemination of computer power will boost industrial and economic development.

The greatest area of cooperation among international collaborations, industry and government procurement programs is system software -- developing novel operating systems; software tools for performance monitoring (particularly for energy efficient computation); and system management software that will cope with hardware failures, both in processor nodes and in memory and storage.

A variety of software toolkits have been developed to monitor various aspects of the performance of an HPC machine, but they did not all talk to each other in a straightforward way. Research to improve the tools has to be international.

One such international collaboration is the "Virtual Institute -- High Productivity Supercomputing (VI-HPS)," which brings together nine partners from the EU, a team at the University of Oregon and one at the University of Tennessee as well as collaborators from the Lawrence Livermore National Laboratory.

To read more, go to *Scientific Computing*,

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance. To send input to the *Livermore Lab Report*, send e-mail.